

THE CLAIMS

What is claimed is:

5 1. A method for providing a smooth wafer surface comprising:
 formulating an abrasive mixture by mixing diamond particles and silica particles in a
solution based on a predetermined diamond/silica volume ratio; and
 polishing a surface of the wafer with the abrasive mixture to obtain a desired smooth
wafer surface that is sufficient for molecular bonding to another polished substrate face.

10 2. The method according to claim 1 further comprising bonding the smooth wafer
surface to at least one other wafer to form a multilayer structure.

 3. A method according to claim 1 wherein the wafer comprises a polar material.

15 4. A method according to claim 3 wherein the material is a semiconductor material.

 5. A method according to claim 4 wherein the material is silicon carbide.

20 6. The method according to claim 4 wherein the predetermined volume ratio is 0.29
to 0.35.

 7. The method according to claim 6 wherein the predetermined volume ratio is 0.3 to
0.33.

25 8. The method according to claim 4 wherein the silica is a colloidal silica and the
diamond particles have a grain size of between about 0.6 and 0.9 μm .

 9. A method according to claim 8 wherein the polishing is conducted with a polishing
30 head rotating at between about 10 to 100 rpm and a polishing turntable also rotating at about
10 to 100 rpm.

10. A method according to claim 8 wherein the polishing is conducted with a polishing head rotating at between about 35 to 65 rpm and a polishing turntable also rotating at about 35 to 65 rpm.

5 11. A method according to claim 9 wherein the polishing head and turntable rotate at essentially the same speed.

12. A method according to claim 9 wherein the polishing head is pressed against the wafer surface with a force of about 10 to 50 daN.

10 13. A method according to claim 9 wherein the polishing head is pressed against the wafer surface with a force of about 7 to 15 daN.

14. A method according to claim 8 wherein the polishing is performed for a duration
15 of about 30 minutes to 2 hours.

15. A method according to claim 8 which further comprises polishing with at least one of an IC1000 polishing cloth or an IC1400 polishing cloth.

20 16. A method according to claim 5 wherein polishing is performed on at least one of the Si face of the wafer or the C face of the wafer.

17. A method according to claim 1 further comprising final cleaning to avoid crystallization of abrasive agents on the wafer surface.